Ohio Agricultural Experiment Station.

CIRCULAR 83.

WOOSTER, OHIO, JULY 1, 1908.

PLANS AND SUMMARY TABLES

OF THE EXPERIMENTS AT THE CENTRAL FARM, WOOSTER,

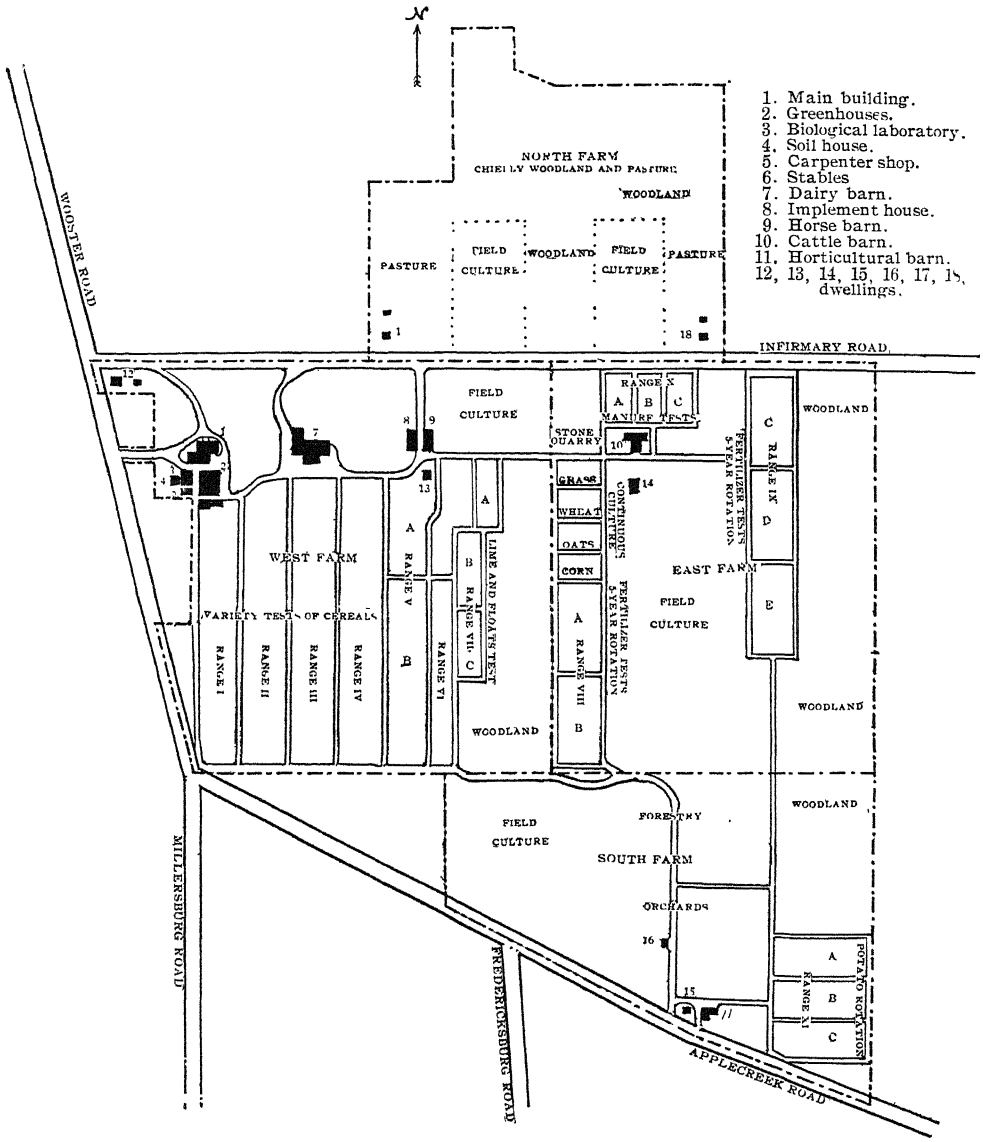
ON THE

MAINTENANCE OF SOIL FERTILITY

ARRANGED FOR REFERENCE IN THE FIELD.

ANNOUNCEMENT.

The experiments reported in the following pages were begun in 1893, immediately after the removal of the Experiment Station to Wayne county. The general plan of this work and the results obtained up to that time are published in Bulletin 110, issued in December, 1899, (now out of print) and again in Bulletins 182, 183 and 184, reporting to the end of 1906. It now seems desirable to follow these general publications with a brief annual statement, giving as briefly as possible the new data obtained from each successive crop, and referring the reader to Bulletins 182 and 183 for more complete information respecting the nature of the soils under experiment and the general plan of the work.


1. Main building.
2. Greenhouses.
3. Biological laboratory.
4. Soil house.
5. Carpenter shop.
6. Stables
7. Dairy barn.
8. Implement house.
9. Horse barn.
10. Cattle barn.
11. Horticultural barn.
12, 13, 14, 15, 16, 17, 18, dwellings.
NORTH FARM
CHIEFLY WOODLAND AND PASTURE
WOODLAND
PASTURE
FIELD CULTURE
WOODLAND
FIELD CULTURE
PASTURE
WOOSTER ROAD
INFIRMARY ROAD
FIELD CULTURE
STONE QUARRY
RANGE X
A B C
MANURE TESTS
WOODLAND
FERTILIZER TESTS 5 YEAR ROTATION
RANGE IX
C
D
E
WEST FARM
VARIETY TESTS OF CEREALS
RANGE I
RANGE II
RANGE III
RANGE IV
A
RANGE V
B
RANGE VI
A
B
RANGE VII
C
LIME AND FLOATS TEST
WOODLAND
GRASS
WHEAT
OATS
CORN
CONTINUOUS CULTURE
A
RANGE VIII
B
FERTILIZER TESTS 5 YEAR ROTATION
EAST FARM
FIELD CULTURE
WOODLAND
WOODLAND
FIELD CULTURE
FORESTRY
SOUTH FARM
ORCHARDS
MILLERSBURG ROAD
FREDERICKSBURG ROAD
APPLECREEK ROAD
A
B
C
RANGE XI
POTATO ROTATION

FERTILIZERS AND MANURE ON CROPS GROWN CONTINUOUSLY ON THE SAME LAND.

Wheat, oats and corn, one acre (10 plots) each, have been grown in this experiment since 1894. The fertilizers are applied to Plots 2 and 8 in arbitrary quantities, while on Plots 3 and 9 the three fertilizing elements, nitrogen, phosphorus and potassium, are given in approximately the same ratio to each other in which they are found in the plant.

The applications to Plots 2 and 8 have in every case produced larger yields than those to Plots 3 and 9, but this may in part be accounted for by the combined nitrogen which is carried to the soil in rain, thus enabling the crops grown on 2 and 8 to utilize larger quantities of the phosphorus and potassium given in the fertilizer than merely that required to balance the fertilizer nitrogen.

The manure applications on plots 5 and 6 were intended to carry nitrogen in quantities equivalent to the applications on Plots 2 and 3 on the one hand and 8 and 9 on the other, estimating the manure to carry 10 pounds of nitrogen per ton, but actual analyses of manure, made during recent years, indicate that this estimate was too high for open yard manure, such as is used in these tests. The average application of phosphorus and potassium in the manure closely approximates the average given to the four fertilized plots.

In this test the corn and wheat show a rapid falling off in yield on the unfertilized land during recent years. The oats also show a reduction in yield, but not so great as that of the other crops.

It is much more difficult to control the weed growth in the wheat and oats grown continuously than where the same crops are grown in rotation, and it has been necessary to divide these tracts and fallow the two ends in alternate seasons in order to destroy the weeds.

Diagram I shows the arrangement of plots and plan of fertilizing in this experiment, and the general outcome is shown in Table I, which gives the yields by periods.

DIAGRAM I PLAN OF FERTILIZING IN CONTINUOUS CULTURE

[Fertilizing materials in pounds per acre]

Wheat	1 None
	2 Acid phos 160 muriate potash 100 nitrate soda 160
	3 Acid phos 60 muriate potash 30 nitrate soda 160
	4 None
	5 Yard manure 2 tons
	6 Yard manure 5 tons
	7 None
	8 Acid phos 160 muriate potash 100 nitrate of soda 320
	9 Acid phos 120 muriate potash, 60 nitrate of soda 320
	10 None
Oats	1 None
	2 Acid phos 160 muriate potash 100 nitrate soda 160
	3 Acid phos 55 muriate potash 50, nitrate soda 160
	4 None
	5 Yard manure 2 tons
	6 Yard manure 5 tons
	7 None
	8 Acid phos 160, muriate potash 100 nitrate soda 320
	9 Acid phos 110 muriate potash 100 nitrate soda 320
	10 None
Corn	1 None
	2 Acid phos 160, muriate potash 100, nitrate soda 160
	3 Acid phos 45, muriate potash 30, nitrate soda 160
	4 None
	5 Yard manure 2[1] tons
	6 Yard manure 5 tons
	7 None
	8 Acid phos 160, muriate potash 100, nitrate soda 320
	9 Acid phos, 90, muriate potash, 60, nitrate soda, 320
	10 None

(South)

TALBE I: YIELD AND INCREASE PER ACRE OF CROPS GROWN IN CONTINUOUS CULTURE.

Plot No.	Fertilizing materials. Pounds per acre.	1907 Yield Grain Bus.	1907 Yield Stover or straw Lbs.	1907 Increase Grain Bus.	1907 Increase Stover or straw Lbs.	14 years, 1894-1907. Yield Grain Bus.	14 years, 1894-1907. Yield Stover or straw Lbs.	14 years, 1894-1907. Increase Grain Bus.	14 years, 1894-1907. Increase Stover or straw Lbs.	Plot No.
	CORN									
1	None	9.79	1,640	....	.....	23 12	1,415	.....	.....	1
2	Acid phosphate, 160; muriate potash, 100; nitrate soda, 160	33 79	2,670	26 38	1,243	43.86	2,281	22.12	921	2
3	" " 60; " " 30; " " 160	19 86	2,500	14.84	1,287	36.52	1,908	16.17	603	3
4	None	2.64	1,000	.....	.....	18.96	1,249	.....	.....	4
5	Yard manure, 2½ tons	13 30	1,770	10.40	747	30.42	1,747	12.05	512	6
6	" " 5 "	24.75	2,520	21.58	1,473	39.94	2,099	21.99	878	6
7	None	3 43	1,070	.....	.....	17 43	1,207	.....	.....	7
8	Acid phosphate, 160; muriate potash, 100; nitrate soda, 320	41.93	2,820	37.82	1,803	47.82	2,326	31.41	1,173	8
9	" " 120; " " 60; " " 320	42 03	3,210	37 25	2,247	45.69	2 199	30 32	1,099	9
10	None	5.46	910	.....	.....	14.34	1,046	.....	.....	10
	Average unfertilized yield	5.33	1 155	.....	.....	18 96	12.49	.....	.....	
	OATS									
1	None	12 42	802	.....	.....	21 64	780	.....	.....	1
2	Acid phosphate, 160; muriate potash, 100; nitrate soda, 160	31 72	2,375	18 96	1,647	42.69	1,823	20.34	1,006	2
3	" " 55; " " 50; " " 160	24 61	1,922	11.51	1,268	38 62	1,587	15.57	737	3
4	None	13 44	580	.....	.....	23.77	887	.....	.....	4
5	Yard manure, 2½ tons	23 98	1,622	10 49	937	31 98	1,217	7 98	298	5
6	" " 5 "	30.31	2,480	16.77	1,690	39.06	1,699	14.84	747	6
7	None	13.59	895	.....	.....	24.46	985	.....	.....	7
8	Acid phosphate, 160; muriate potash, 100; nitrate soda, 320	36 72	3,245	22.90	2,317	48.59	2,363	23.73	1,379	8
9	" " 110; " " 100; " " 320	34.14	3,157	20 08	2,228	46 79	2,218	21.55	1,239	9
10	None	14.29	962	.....	.....	25.64	977	.....	.....	10
	Average unfertilized yield	13 43	810	.....	.....	24.19	913	.....	.....	
	WHEAT									
1	None	5 41	775	.....	.....	8.09	1,087	.....	.....	1
2	Acid phos., 160; mur. potash, 100; nit. soda, 120; dried blood, 50	19.33	3,080	13.81	2,295	19 03	2,363	10.00	1,314	2
3	" " 45; " " 30; " " 120; " " 50	14.41	2,225	8.77	1,430	15.02	1,782	6.65	771	3
4	None	5.75	805	.....	.....	8.51	974	.....	.....	4
5	Yard manure, 2½ tons	10.92	1,785	5.02	826	12.61	1,593	4.15	611	5
6	" " 5 "	16 16	2,830	10.11	1,917	16 32	2,055	7.92	1.081	6
7	None	6.20	967	.....	.....	8 36	974	.....	.....	7
8	Acid phos., 160; mur. potash, 100; nit. soda, 200; dried blood, 50	23.37	3,927	17.56	3,043	21.51	2,749	13 36	1,801	8
9	" " 90; " " 60; " " 200; " " 50	21 50	3,560	16.07	2,760	19 51	2 333	11 50	1,413	9
10	None	5.04	717	.....	....	7.75	893	.....	....	10
	Average unfertilized yield	5.60	816	.....	.....	8.18	982	.....	.....	

THE 5-YEAR ROTATION.

In this experiment corn, oats, wheat, clover and timothy are grown in succession on 5 tracts of land, A, B, C, D and E, containing 30 one-tenth acre plots each. Sections A and B of this test lie in Range VIII, south of the areas devoted to continuous cropping, while Sections C, D and E occupy Range IX, near the east side of the farm.

The land was underdrained in 1893 and corn was grown that season on Section C. The planting was delayed by the draining and the season proved unfavorable, so that the results of that season's work have not been included in the average. In 1894 wheat was harvested on Section A, oats on Section C and corn on Section D. The clover and timothy followed the wheat on Section A in 1895 and 1896, and the rotation has since been regularly followed.

In 1895 and 1896, and again in 1899, 1900 and 1901 the wheat in this test was injured by Hessian fly, the yield on the unfertilized land falling to a small fraction over one bushel per acre in 1896 and 1900.

Diagram II shows the arrangement of plots and plan of fertilizing one of the sections in this experiment, the 5 sections being arranged and treated exactly alike. Tables II, III, IV and V give the yields per acre by periods.

DIAGRAM II: PLAN OF FERTILIZING IN 5-YEAR ROTATION.

Plot No.	Fertilizing materials in pounds per acre.									
	On corn			On oats			On wheat			
	Acid phosphate	Muriate of potash	Nitrate of soda	Acid phosphate	Muriate of potash	Nitrate of soda	Acid phosphate	Muriate of potash	Dried blood	Nitrate of soda
1	....	..	....	....	....	..	..	....	....	....
2	80	..	..	80	....	....	160	....	..	....
3	....	80	....	....	80	..	..	100	...	..
4	. .	....	....	....	....	....	....	....	..	..
5	..	....	160	....	....	160	..	....	50	120
6	80	....	160	80	....	160	160	..	50	120
7	....	....	....	....	....	....	....	....	....	....
8	80	80	....	80	80	....	160	100	...	....
9	....	80	160	..	80	160	....	100	50	120
10	..	....	....	...	....	....	....	....	....	..
11	80	80	160	80	80	160	160	100	50	120
12	80	80	240	80	80	240	160	100	50	200
13	....	....	....	....	....	....	....	....	...	....
14	80	80	160	....	..	..	160	100	50	120
15	....	....	....	....	....	....	160	100	50	120
16	....	....	....	....	....	....	....	..	..	....
17	160	80	80	160	80	80	160	100	25	60
18	Barnyard manure, 8 tons on corn and wheat									
19	....	....	....	....	....	....	....	....	....	..
20	Barnyard manure, 4 tons on corn and wheat									
21	Same elements as 17, but nitrogen in oilmeal									
22	....	....	....	....	....	....	....	....	....	....
23	Same elements as 17, but nitrogen in dried blood									
24	Same elements as 17, but nitrogen in sulphate ammonia									
25	....	....	....	....	....	....	....	..	....	....
26	Same elements as 11, but phosphorus in bone meal									
27	Same elements as 11, but phosphorus in dissolved bone black									
28	....	....	....	....	....	....	....	..	..	..
29	Same elements as 11, but phosphorus in basic slag									
30	Same elements as 17, but nitrogen in tankage									

TABLE II: YIELD AND INCREASE PER ACRE OF **Corn** GROWN IN 5-YEAR ROTATION: 1907 AND 14 YEARS, 1894 TO 1907.

Plot	Fertilizing materials.	1907				14 years, 1894-1907				Plot
		Yield		Increase		Yield		Increase		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
No.	Pounds per acre.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	No.
1	None	27.42	2,280	.....	.....	32.32	1,682	.....	.....	1
2	Acid phosphate, 80	38.25	2,820	7.33	427	39 81	1,902	7.66	224	2
3	Muriate potash, 80	49.86	3,480	15.43	973	36.89	1,939	4.90	266	3
4	None	37.93	2,620	.....	.....	31 82	1,669	.....	.....	4
5	Nitrate soda, 160	44.24	3,050	5.85	370	36 52	1,841	4.49	175	5
6	Acid phosphate, 80; nitrate soda, 160	52.18	3,070	13.32	330	46 14	2,028	13.90	365	6
7	None	39.32	2,800	.....	.....	32.45	1,661	.....	.....	7
8	Acid phosphate, 80; muriate potash, 80	58.57	3,740	20.45	967	45.26	2,194	13.55	561	8
9	Muriate potash, 80; nitrate soda, 160	51.65	3,330	14.74	583	36 83	1,917	5.85	314	9
10	None	35 71	2,720	.....	.....	30.21	1,575	.....	.....	10
11	Acid phosphate, 80; muriate potash, 80; nitrate soda, 160	64 39	4,350	28.19	1,570	48.72	2,290	18 08	684	11
12	" " 80; " " 80; " " 240	65 32	4,270	28.63	1,430	49.09	2,309	18.05	672	12
13	None	37.18	2,900	.....	.....	31 46	1,667	.....	.....	13
14	Acid phosphate, 80; muriate potash, 80; nitrate soda 160[1]	53.82	3,900	18 29	1,047	46 42	2,244	15 78	583	14
15	Fertilized on wheat only	47.72	3,300	13.14	493	36 42	1,858	8 00	244	15
16	None	32.93	2,760	.....	.....	29 04	1,648	.....	.....	16
17	Acid phosphate, 160; muriate potash, 80; nitrate soda, 80[2]	48.29	4,150	12 98	1,297	46.24	2,287	16 44	608	17
18	Barnyard manure, 8 tons each on corn and wheat	70.85	4,340	33 16	1,393	50 38	2,426	19.32	717	18
19	None	40.07	3,040	.....	.....	32.64	1,741	.....	.....	19
20	Barnyard manure, 4 tons each on corn and wheat	67 92	4 160	28.18	1,013	44 23	2,189	12 77	472	20
21	Same elements as 17, but nitrogen in oilmeal	75.39	4,560	35 87	1,307	41 10	2,279	16.81	587	21
22	None	39.24	3,360	.....	.....	29.12	1,667	.....	.....	22
23	Same elements as 17, but nitrogen in dried blood	76.25	4,660	34.30	1,280	46 94	2,272	16.82	576	23
24	Same elements as 17, but nitrogen in sulphate ammonia	72.50	4,600	27.85	1 200	47.47	2,320	16 34	595	24
25	None	47.36	3,420	.....	.....	32.12	1,754	.....	.....	25
26	Same elements as 11, but phosphorus in bonemeal	64.57	4,040	17.56	587	47.15	2,328	14.44	551	26
27	Same elements as 11, but phosphorus in dissolved bone black	58 78	4,050	12.11	563	48 22	2,326	14.93	525	27
28	None	46 32	3,520	.....	.....	33.88	1,824	.....	.....	28
29	Same elements as 11, but phosphorus in basic slag	65 29	4,340	18.97	820	49.34	2,413	15 46	589	29
30	Same elements as 17, but nitrogen in tankage[3]	73 10	4,040	26.78	520	47.39	2,250	13.51	426	30
	Average unfertilized yield	38.35	2,942	.....	.....	31 51	1 688	.....	.....	

[1]Fertilized on corn and wheat only. [2]Since first rotation: Previously same quantities of elements as 11. [3]Since second rotation: previously this plot received less fertilizer.

TABLE III: YIELD AND INCREASE PER ACRE OF **Oats** GROWN IN 5-YEAR ROTATION: 1907, AND 14 YEARS, 1894 TO 1907.

Plot	Fertilizing materials.	1907				14 years, 1894-1907				Plot
		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
No.	Pounds per acre	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	No.
1	None	21.71	1,475	.....	.....	31.66	1,257	.....	.....	1
2	Acid phosphate, 80	24.69	1,690	4.44	375	39.75	1,516	7.85	277	2
3	Muriate potash, 80	20 62	1,340	1.82	185	34.49	1,297	3.17	75	3
4	None	17 34	995	.....	.....	31 15	1,204	.. ..	.....	4
5	Nitrate soda, 160	20.55	1,352	3.24	320	35.31	1,348	4.31	153	5
6	Acid phosphate, 80; nitrate soda, 160	30.15	1,795	12.86	725	45.99	1,783	15.13	596	6
7	None	17 26	1,107	.....	.....	30.71	1,178	.....	.....	7
8	Acid phosphate, 80; muriate potash, 180	25 15	1,795	7.50	660	41.80	1,648	11 17	481	8
9	Muriate potash, 80; nitrate soda, 160	24 84	2,005	6.73	843	35.50	1,419	4.94	263	9
10	None	18.44	1,190	.....	.....	30.48	1,145	.....	.....	10
11	Acid phosphate, 80; muriate potash, 80; nitrate soda, 160	32 97	2,745	14.84	1,562	49.58	2,070	18.96	895	11
12	" " 80; " " 80; " " 240	32.66	2,395	14.85	1,218	48.92	2,165	18.16	960	12
13	None	17.50	1,170	.....	.....	30.89	1,235	.....	.....	13
14	Fertilized on corn and wheat only	22.89	1,627	6.20	558	38.22	1,578	8 08	388	14
15	Fertilized on wheat only	19.84	1,295	3.96	327	31.60	1,224	3.50	162	15
16	None	15 07	867	.....	.....	28 62	1,107	.....	.....	16
17	Acid phosphate, 160; muriate potash, 80; nitrate soda, 80[1]	28 91	2,315	13.84	1,398	46 76	2,018	17.70	889	17
18	Manured on corn and wheat	25 94	1,920	10 86	953	41.20	1,783	11.11	635	18
19	None	15 08	1,017	.....	.....	29 92	1,173	.....	.....	19
20	Manured on corn and wheat	22.19	1,440	7.35	482	36.11	1,476	6.49	320	20
21	Same elements as 17, but nitrogen in oilmeal	26.88	1,950	12.27	1,051	46 04	1,955	16.74	797	21
22	None	14.37	840	.....	.....	29 04	1,123	.....	.....	22
23	Same elements as 17, but nitrogen in dried blood	28.28	2,345	13.23	1,407	46.37	1,912	16.80	753	23
24	Same elements as 17, but nitrogen in sulphate ammonia	28.28	2,375	12.56	1,338	47 80	2,119	17.70	922	24
25	None	16.40	1,135	.....	.....	30.63	1,235	.....	.....	25
26	Same elements as 11, but phosphorus in bone meal	29.21	2,385	12 99	1,298	46.42	1,888	15.29	664	26
27	Same elements as 11, but phosphorus in dissolved boneblack	30.52	2,802	14.49	1,762	49.51	2,084	17.88	871	27
28	None	15.85	992	.....	.....	32.13	1,203	.....	.....	28
29	Same elements as 11, but phosphorus in basic slag	28 28	2,435	12.43	1,443	47 59	1,927	15.46	724	29
30	Same elements as 17, but nitrogen in tankage[2]	25.64	2,170	9.79	1,178	43 57	1,750	11.44	547	30
	Average unfertilized yield	16.90	1,079	.....	.....	30 52	1,186	.....	.....	

[1]Since first rotation; previously same quantities of elements as 11. [2]Since second rotation; previously this plot received less fertilizer.

TABLE IV: YIELD AND INCREASE PER ACRE OF **Wheat** GEOWN IN 5-YEAR ROTATION: 1907, AND 14 YEARS, 1894 TO 1907.

Plot	Fertilizing materials.	1907				14 years, 1894-1907				Plot
		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
No.	Pounds per acre	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Lbs.	Lbs.	No.
1	None	14.54	1,967	.....	.....	9 65	1,041	.....	.....	1
2	Acid phosphate, 160	24 20	2,867	9.17	962	17.54	1,786	7.73	744	2
3	Muriate potash, 100	16.66	1,960	1.15	118	11.22	1,202	1 26	160	3
4	None	16.00	1,780	.....	.....	10.12	1,045	.....	.....	4
5	Dried blood, 50; nitrate soda, 120	19.08	2,255	3.15	464	12.10	1,345	1 96	288	5
6	Acid phosphate, 160; dried bloood, 50; nitrate soda, 120	31.75	3,795	15.89	1,994	23.13	2,385	12.96	1,318	6
7	None	15.79	1,812	.....	.....	10.18	1,080	.....	.....	7
8	Acid phosphate, 160; muriate potash, 100	22.95	2,502	8 06	846	18 94	1,779	8.83	727	8
9	Muriate potash, 100; dried blood, 50; nitrate soda, 120	17.87	2,067	3.89	566	12 74	1,348	2.70	324	9
10	None	13.08	1,345	.....	.....	9 96	996	.....	.....	10
11	Acid phos., 160: mur. potash, 100; dried blood, 50; nit. soda, 120	29.79	3,752	16 57	2,366	26 00	2,763	16 02	1,751	11
12	Acid phos., 160; mur. potash, 100; dried blood, 50; nit. soda, 200	33.83	4,080	20.47	2,652	27.42	2,851	17.41	1,824	12
13	None	13.50	1,470	.....	.....	10 04	1,043	.....	.....	13
14	Acid phos., 160; mur. potash, 100; dried blood, 50; nit. soda, 120[1]	28.66	3,500	15.08	1,995	24.22	2,554	14 50	1,559	14
15	Acid phos., 160; mur. potash, 100; dried blood, 50; nit. soda, 120[2]	27 00	3,340	13 33	1,800	23.24	2,408	13.84	1,461	15
16	None	13.75	1,575	.....	.....	9 09	900	.....	.....	16
17	Acid phos., 160; mur. potash, 100; dried blood, 25; nit. soda, 60[3]	26.58	3,175	12 47	1,605	21 25	2,137	11 94	1,205	17
18	Barnyard manure, 8 tons	30.12	3,572	15.65	2,007	19.64	2,146	10.12	1,181	18
19	None	14.83	1,560	.....	.....	9.74	997	.....	.....	19
20	Barnyard manure, 4 tons	22.50	2,920	8 54	1,431	16.12	1,754	6.51	779	20
21	Same elements as 17, but nitrogen in oilmeal	21.75	2,715	8 67	1,297	22.84	2,375	13 37	1,423	21
22	None	12.21	1,347	.....	.....	9.34	929	.....	.....	22
23	Same elements as 17, but nitrogen in dried blood	20.04	2,247	8 01	899	21.50	2,140	11.82	1,165	23
24	Same elements as 17, bnt nitrogen in sulphate ammonia	24.16	3,070	12.32	1,721	22 05	2,207	12.04	1,186	24
25	None	11,66	1,350	.....	.....	10.34	1,068	.....	.....	25
26	Same elements as 11, but phosphorus in bone meal	26.83	3,020	14 68	1,660	22.89	2,343	12 64	1,307	26
27	Same elements as 11, but phosphorus in dissolved boneblack	29.25	3,555	16.62	2,185	25 69	2,604	15 54	1,601	27
28	None	13.12	1,380	.....	.....	10.06	971	.....	.....	28
29	Same elements as 11, but phosphorus in basic slag	27.29	3,202	14.16	1,822	23.98	2,472	13 92	1,501	29
30	Same elements as 17, but nitrogen in tankage[4]	28.87	3,267	15.75	1,887	21.36	2,063	11.30	1,092	30
	Average unfertilized yield	13.85	1,559	.....	.....	9.85	1,007	.....	.....	

[1]Fertilized on corn and wheat only. [2]Fertilized on wheat only. [3]Since first rotation; previously same quantities of elements as 11. [4]Since second rotation; previously this plot received less fertilizer.

TABLE V: YIELD AND INCREASE PER ACRE OF **Clover** AND **Timothy** GROWN IN 5-YEAR ROTATION: 1907 AND DURING THE ENTIRE PERIOD OF THE EXPERIMENT.

Plot	Total quantities of fertilizing materials applied to previous crops of the rotation. None on clover or timothy.	1907				Entire period				Plot
		Clover		Timothy		Clover, 13 years		Timothy, 12 years		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
No.	Pounds per acre	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	No.
1	None	1,164	.....	3,830	.....	1,718	.....	2,954	.....	1
2	Acid phosphate, 320	1,831	631	4,444	788	2,160	383	3,129	213	2
3	Muriate potash, 260	1,057	—178	3,324	—157	1,965	70	3,029	150	3
4	None	1,271	.....	3,307	.....	1,892	.....	2,839	.....	4
5	Nitrate soda, 440; dried blood, 50	1,537	227	4,729	1,468	2,198	345	3,206	426	5
6	Acid phosphate 320; nitrate soda, 440; dried blood, 50	2,391	1,043	5,475	2,261	2,790	976	3,479	759	6
7	None	1,387	.....	3,168	.....	1,775	.....	2,661	.....	7
8	Acid phosphate, 320; muriate potash, 260	2,311	957	4,471	1,233	2,463	671	3,063	429	8
9	Muriate potash, 260; nitrate soda, 440; dried blood, 50	1,555	234	3,982	674	2,167	358	2,987	378	9
10	None	1,288	.....	3,378	.....	1,825	.....	2,584	.....	10
11	Acid phos., 320; mur. potash, 260; nit. soda, 440; dried blood, 50	3,031	1,687	5,529	2,362	2,969	1,175	3,572	984	11
12	Acid phos., 320; mur. potash, 260; nit. soda, 680; dried blood, 50	3,183	1,782	5,467	2,510	3,045	1,282	3,456	862	12
13	None	1,457	.....	2,746	.....	1,732	.....	2,597	.....	13
14	Acid phos., 240; mur. potash, 180; nit. soda, 280; dried blood, 50	2,293	880	4,631	1,822	2,658	963	3,258	693	14
15	Acid phos., 160; mur. potash, 100; nit. soda, 120; dried blood, 50	1,919	550	3,893	1,021	2,258	601	2,959	425	15
16	None	1,395	.....	2,935	.....	1,620	.....	2,502	.....	16
17	Acid phos., 480; mur. potash, 260; nit. soda, 220; dried blood, 25	3,258	1,853	5,262	2,171	2,691	1,029	3,160	615	17
18	Yard manure, 16 tons	5,066	3,582	6,974	3,726	3,428	1,725	3,939	1,351	18
19	None	1,564	.....	3,404	.....	1,745	.....	2,631	.....	19
20	Yard manure, 8 tons	3,324	1,944	5,778	2,451	2,713	1,039	3,420	865	20
21	Same elements as 17, but nitrogen in oilmeal	2,658	1,461	4,933	1,683	2,450	848	3,071	592	21
22	None	1,013	.....	3,173	.....	1,531	.....	2,402	.....	22
23	Same elements as 17, but nitrogen in dried blood	2,347	1,236	5,360	1,968	2,403	785	3,065	568	23
24	Same elements as 17, but nitrogen in sulphate ammonia	1,640	1,431	4,373	761	2,460	755	2,949	356	24
25	None	1,307	.....	3,831	.....	1,792	.....	2,688	.....	25
26	Same elements as 11, but phosphorus in bonemeal	2,968	1,747	6,444	2,163	3,015	1,192	3,663	882	26
27	Same elements as 11, but phosphorus in dissolved boneblack	2,454	1,319	6,035	1,303	2,669	817	3,500	629	27
28	None	1,049	.....	5,182	.....	1,885	.....	2,964	.....	28
29	Same elements as 11, but phosphorus in basic slag	2,356	1,307	6,435	1,253	2,847	962	3,855	890	29
30	Same elements as 17, but nitrogen in tankage	2,933	1,884	6,622	1,440	2,767	882	3,783	819	30
	Average unfertilized yield	1,282	.....	3,495	.....	1,752	.....	2,682	.....	

In table VI is given the financial outcome, reckoning the cost of nitrogen at 19 cents per pound, phosphorus at 13 cents, and potassium at 6 cents, the present retail cost of these elements in nitrate of soda, muriate of potash and acid phosphate in one ton lots, freight paid to Ohio points, and estimating corn at 40 cents per bushel, oats at 30 cents, wheat at 80 cents, hay at $8.00 per ton, stover at $3.00 and straw at $2.00.

The valuations for nitrogen and phosphorus are considerably higher than those previously employed, because of the increasing prices of nitrate of soda and acid phosphate; but even at these high valuations, it will be seen that the complete fertilizer is giving not only the largest total yield but also the largest net profit, after deducting the cost of the fertilizer.

The rate of increase is steadily growing, and this is not due to a falling off in yield of the unfertilized land, but is a positive gain, thus showing that the treatment is increasing the actual fertility of the soil.

TABLE VI: SUMMARY FOR 5-AEAR ROTATION: POUNDS OF FERTILIZING ELEMENTS APPLIED, COST OF FERTILIZERS, AND TOTAL AND NET VALUE OF INCREASE PER ACRE FOR AVERAGE ROTATION.

Plot	Fertilizing elements			Cost of fertilizers	Total value of increase		Net value of increase		Plot
	Phosphorus	Potassium	Nitrogen		1907	14 years 1894-1907	1907	14 years, 1894-1907	
No.	Lbs.	Lbs.	Lbs.	$	$	$	$	$	No.
2	20	...	...	2.60	19.25	15 34	16.65	12.74	2
3	..	108	..	6 50	7.34	5.43	.84	* —1.07	3
5	..	...	76	14 40	13.95	8 44	* —.45	* —5.96	5
6	20	..	76	17.00	38.33	29 87	21.33	12.87	6
8	20	108	...	9.10	28.59	22.28	19.49	13.18	8
9	..	108	76	20.90	16.96	9.98	* —3.94	* —10 92	9
11	20	108	76	23.50	51.46	38.04	27.96	14.54	11
12	20	108	114	30 70	55.47	38 96	24.77	8.26	12
14	15	75	50⅔	16.05	36.17	29.73	20.12	13.73	14
15	10	42	25⅓	8.60	26.72	21.41	18.12	12 81	15
17	30	108	38	17 60	40.39	31.02	22.76	13.42	17
18	20	26	58	?	63 32	34 35	?	?	18
20	10	13	29	?	41 30	21.69	?	?	20
21	30	108	38	17.60	41.85	31.30	24.25	13.70	21
23	30	108	38	17 60	41.24	29.42	23.64	11.82	23
24	30	108	38	17.60	38.39	28 92	20.79	11.32	24
26	20	108	76	23.50	42.14	31.57	18.64	8.07	26
27	20	108	76	23.50	37.77	32 81	14.27	9.31	27
29	20	108	76	23.50	38.37	32.48	13.87	* 8 98	29
30	30	108	38	17.60	43 33	26 95	25.73	9.35	30

*Loss

THE POTATOES-WHEAT-CLOVER ROTATION.

This experiment is located on the South farm, south-east of the orchards, and contains 3 sections of 34 plots each. The south section (A) and about half of the middle section (B) had been in cultivation for an unknown period before the test began. The north part of Section B and all of the north section (C) were cleared from the forest for the purposes of this test. The cleared land was tile drained in 1893 and the work was begun by planting Section A to potatoes in 1894. Wheat and clover followed in 1895 and 1896 and the rotation has been maintained regularly since.

The potato crops in this test have in some seasons been somewhat injured by blight, and in 1904 a dashing rain, coming just after the potatoes had been planted, washed much of the seed out of the ground. These difficulties have caused an irregular stand, and for this reason the results have been calculated on the basis of the average stand obtained on the unfertilized plots, a method of calculation which tends to reduce the differences between the yields, so that the increase, as reported in Table IX, is less than that actually obtained.

In 1895 and 1896 the wheat in this test was severely injured by Hessian fly, but it escaped the attack of 1899 to 1901.

In 1900 the clover failed: attempts were made to grow crimson clover and soy beans in its stead, but there was failure in securing a stand of these crops also, so that it has been necessary to omit that season from the calculations. In 1905 continuous rains prevented harvesting the crop until very late, and caused the fertilized crops to lodge, so that these plots weighed less than those not fertilized, though earlier in the season they had shown a distinctly stronger growth. As there was no way by which the yields could be corrected and as it seemed desirable to include the crop in the general average because of its effect on the average unfertilized yield it has been so included, although the doing so slightly reduces the apparent average effect from the fertilizers.

DIAGRAM III: PLAN OF FERTILIZING IN POTATOES-WHEAT-CLOVER ROTATION.

[Fertilizing materials in pounds per acre]

Plot No.	On Potatoes			On Wheat			
	Acid phosphate	Muriate of potash	Nitrate of soda	Acid phosphate	Muriate of potash	Dried blood	Nitrate of soda
1	....	....	...	....	....	....	....
2	160	....	....	160	....	....	....
3	....	100	....	....	100	....	....
4	....	....	....	....	....	....	....
5	....	....	80	....	....	50	120
6	160	....	80	160	....	50	120
7	....	....	....	....	....	....	....
8	160	100	....	160	100	....	....
9	....	100	80	....	100	50	120
10	....	....	....	....	....	....	....
11	160	100	80	160	100	50	120
12	160	100	160	160	100	50	200
13	....	....	....	....	....	....	....
14	320	200	160	160	100	50	120
15	480	300	320	....	....	....	....
16	....	....	....	....	....	....	....
17	....	....	....	Manure, 4 tons			
18	....	....	....	Manure, 8 tons			
19	....	....	....	....	....	....	....
20	160	100	80	160	100	25	60
21	Same elements as 20, but nitrogen in oilmeal						
22	....	....	....	....	....	....	....
23	Same elements as 20, but nitrogen in dried blood						
24	Same elements as 20, but nitrogen in sulphate ammonia						
25	....	....	....	....	....	....	....
26	Same elements as 11, but phosphorus in bone meal						
27	Same elements as 11, but phosphorus in dissolved bone black						
28	....	....	....	....	....	....	....
29	Same elements as 11, but phosphorus in basic slag						
30	Manure, 8 tons						
31	....	....	....	....	....	....	....
32	Manure, 16 tons						
33	Same elements as 20, but nitrogen in tankage						
34	....	....	....	....	....	....	....

DIAGRAM IV; ARRANGEMENT OF PLOTS IN POTATOES-WHEAT-CLOVER ROTATION.

PLOTS ONE-TENTH ACRE.

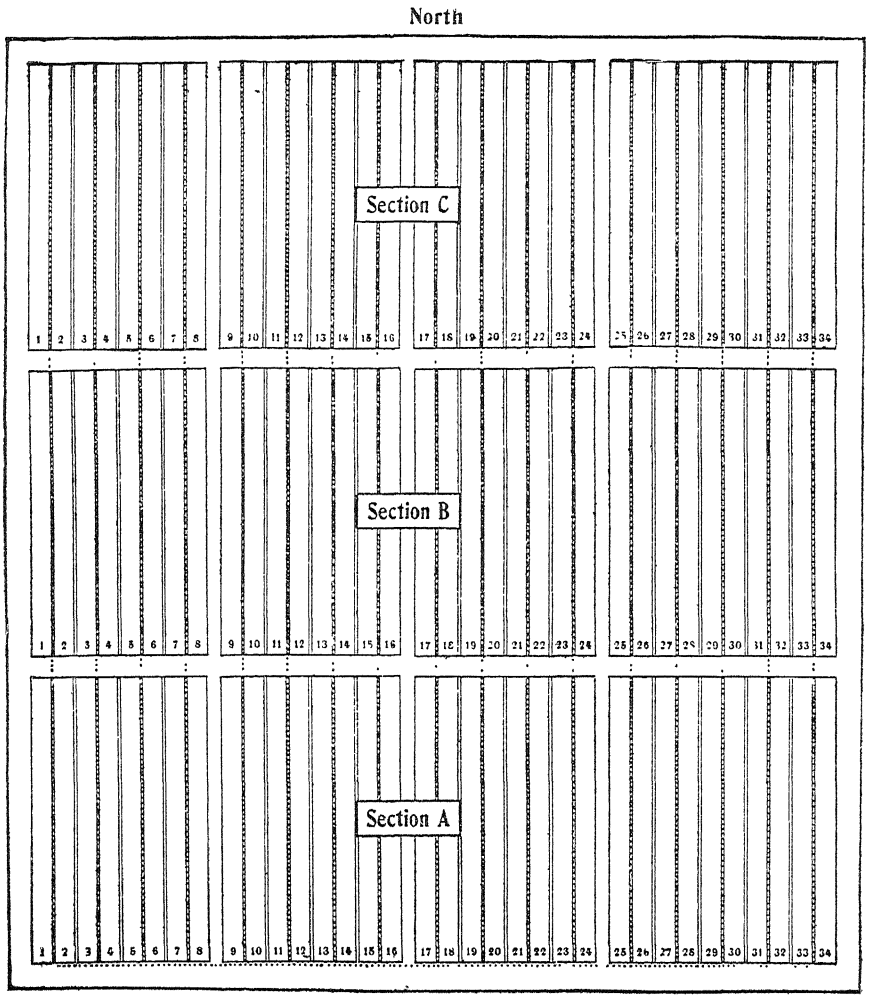


TABLE VII: YIELD AND INCREASE PER ACRE OF **Potatoes** IN POTAOES–WHEAT–CLOVER ROTATION: 1907 AND 14 YEARS, 1893-1907.

Plot	Fertilizing materials	1907		14 years, 1894–1907		Plot
		Yield	Increase	Yield	Increase	
No.	Pounds per acre	Bus.	Bus.	Bus.	Bus.	No.
1	None	155.17	.....	174 03	.....	1
2	Acid phosphate, 160	155.42	6.97	189.45	15.85	2
3	Muriate potash, 100	156.25	14.53	187.18	14.01	3
4	None	135.00	.....	172.74	.....	4
5	Nitrate soda, 80	115.83	–11.83	179.09	10.87	5
6	Acid phosphate, 160; nitrate soda, 80	133.17	13.56	190.22	25.92	6
7	None	111.92	.....	160 08	.....	7
8	Acid phosphate, 160; muriate potash, 100	144.83	22.88	193.50	32.32	8
9	Muriate potash, 100; nitrate soda, 80	140.08	8.11	177.07	14.79	9
10	None	142.00	.....	163.38	.....	10
11	Acid phosphate, 160; muriate potash, 100; nitrate soda, 80	153.67	24.28	186.52	24.44	11
12	Acid phosphate, 160; muriate potash, 100; nitrate soda, 160	164.42	47.64	192.62	32.32	12
13	None	104.17	.....	159 48	.....	13
14	Acid phosphate, 320; muriate potash, 200; nitrate soda, 160	168.17	67.70	197.92	41.29	14
15	Acid phosphate, 480; muriate potash, 300; nitrate soda, 320	150.92	54.14	194 11	42.04	15
16	None	93.08	.....	150.66	.....	16
17	Yard manure, 4 tons on wheat only	125.33	31.89	160 57	12.26	17
18	Yard manure, 8 tons on wheat only	127.75	33.94	163.83	18.70	18
19	None	94.17	.....	145.97	.....	19
20	Acid phosphate, 160; muriate potash, 100; nitrate soda, 80	142.17	47.20	195.54	41.58	20
21	Same elements as 20, but nitrogen in oilmeal	130.58	34.80	181.16	32.07	21
22	None	96.58	.....	150.65	.....	22
23	Same elements as 20, but nitrogen in dried blood	135.58	31.63	182.45	32.81	23
24	Same elements as 20, but nitrogen in sulphate ammonia	152.58	41.25	181.55	32.92	24
25	None	118.70	.....	147.61	.....	25
26	Same elements as 11, but phosphorus in bonemeal	146.70	27.11	175.50	26.02	29
27	Same elements as 11, but phosphorus in dissolved boneblack	156.83	36.32	185.46	34.09	27
28	None	121.42	.....	153.24	.....	28
29	Same elements as 11, but phosphorus in basic slag	167.75	46.78	191.64	29.44	29
30	Yard manure, 8 tons on potatoes only	149.08	28.55	199.38	41.09	30
31	None	120.08	.....	160.82	.....	31
32	YardManure, 16 tons on wheat ouly	166 42	40.03	194 96	39.20	32
33	Same elements (since 1899) as 20, but nitrogen in tankage	162.50	29.81	186 33	34 39	33
34	None	139.00	.....	145.69	.....	34
	Average unfertilized yields	119.27	.....	156 79	.....	

TABLE: VIII: YIELD AND INCREASE PER ACRE OF **Wheat** IN POTATOES–WHEAT–CLOVER ROTATION: 1907 AND 13 YEARS, 1894-1907.

Plot	Fertilizing materials	1907				13 years, 1895-1907				Plot
		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
No.	Pounds per acre	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	No.
1	None	37 00	3,060	.....	.....	30.06	3,064	.....	.....	1
2	Acid phosphate, 160	39 75	3,755	2.31	468	35.17	3,637	5 27	632	2
3	Muriate potash, 100	36 25	3,165	—1.64	—348	31.70	2,923	1.95	—23	3
4	None	38.33	3,740	.....	.....	29 58	2,887	.....	.....	4
5	Nitrate soda, 160	37 50	3,690	.95	203	30 08	3,136	1 05	302	5
6	Acid phosphate, 160; dried blood, 50; nitrate soda, 120	42 66	4,320	7.88	1,087	35.67	3,746	7.21	965	6
7	None	33 00	2,980	.....	.....	27.89	2,727	.....	.....	7
8	Acid phosphate, 160; muriate potash, 100	36 58	3,505	2.83	370	35 21	3,288	7.02	579	8
9	Muriate potash, 100; dried blood, 50; nitrate of soda, 120	39 66	4,040	5.16	750	34 05	3,173	5.57	481	9
10	None	35 25	3,445	.....	.....	28 78	2,674	.....	.....	10
11	Acid phos., 160; mur. potash, 100; dried blood, 50; nit. soda, 120	42 75	4,575	8.03	1,315	37.70	3,639	9.15	930	11
12	Acid phos., 160; mur. potash, 100; dried blood, 50; nit. soda, 200	43 50	5,190	9.31	2,175	37 64	3,792	9.31	1,169	12
13	None	33 66	2,800	.....	.....	28 10	2,598	.....	.....	13
14	Acid phos., 320; mur. potash, 200; dried blood, 50; nit. soda, 120	40.66	4,420	6.56	1,527	37.56	3,719	9.97	1,184	14
15	Fertilized on potatoes only	35.00	3,320	.44	333	35.89	3,458	8 82	986	15
16	None	35.00	3,080	.....	.....	26 57	2,408	.....	.....	16
17	Yard manure, 4 tons	38 42	3,755	4 25	612	30.26	2,945	4 63	565	17
18	Yard, manure, 8 tons	41.33	4,400	8.00	1,193	31 27	3,009	6.57	657	18
19	None	32.50	3,270	.....	.....	23.77	2,324	.....	.....	19
20	Acid phos., 160; mur. potash, 100; dried blood, 25; nit. soda, 60	40.17	4,670	7.88	1,333	32.74	3,202	9 03	932	20
21	Same elements as 20, but nitrogen in oilmeal	37.83	3,810	5.55	407	33.23	3,142	9.57	923	21
22	None	32.17	3,470	.....	.....	23 61	2,167	.....	.....	22
23	Same elements as 20, but nitrogen in dried blood	39.17	3,850	6.95	403	34 09	3,201	10 31	1,013	23
24	Same elements as 20, but nitrogen in sulphate ammonia	39.83	3,830	7.55	407	33 78	3,133	9 82	922	24
25	None	32.33	3,400	.....	.....	24.13	2,234	.....	.....	25
26	Same elements as 11, but phosphorus in bonemeal	40.50	4,390	7.56	880	34.76	3,292	10.52	1,001	26
27	Same elements as 11, but phosphorus in dissolved boneblack	42.33	4,560	8.77	940	36.01	3,572	11.66	1,230	27
28	None	34 17	3,730	.....	.....	24.45	2,396	.....	.....	28
29	Same elements as 11, but phosphorus in basic slag	45.00	4,920	10 55	1,367	36.76	3,687	12 35	1,304	29
30	Manured on potatoes	37.42	4,155	2.70	778	30.89	3,019	6.54	649	30
31	None	35.00	3,200	.....	.....	24.31	2,357	.....	.....	31
32	Yard manure, 16 tons	40 83	4,430	6.22	1,187	37.83	3,773	10 57	1,163	32
33	Same elements as 20, but nitrogen in tankage	40 33	4,000	6.11	713	37.95	3,552	11.08	1,012	33
34	None	33 83	3,330	.....	.....	26 48	2,469	.....	.....	34
	Average unfertilized yield	31.18	3,244	.....	.....	26 01	2,481	.....	.....	

TABLE IX: YIELD AND INCREASE PER ACRE OF **Clover** IN POTATOES-WHEAT-CLOVER ROTATION: 1907 AND 12 YEARS, 1896-1907.

Plot	Total fertilizing materials applied to previous crops of rotation None on clover	1907		12 years, 1896-1907		Plot
		Yield	Increase	Yield	Increase	
No	Pounds per acre	Lbs.	Lbs.	Lbs.	Lbs.	No.
1	None	3,570	.....	3,639	.....	1
2	Acid phosphate, 320	4,140	457	3,810	317	2
3	Muriate potash, 200	4,010	193	3,446	60	3
4	None	3,950	.....	3,204	.....	4
5	Nitrate soda, 200; dried blood, 50	4,020	253	3,424	210	5
6	Acid phosphate, 320: nitrate soda, 200; dried blood, 50	4,100	517	3,523	301	6
7	None	3,400	.....	3,231	.....	7
8	Acid phosphate, 320; muriate potash, 200	4,020	687	3,477	311	8
9	Muriate potash, 200; nitrate soda, 200; dried blood, 50	3,880	613	3,460	359	9
10	None	3,200	.....	3,035	.....	10
11	Acid phosphate, 320; muriate potash, 200; nitrate soda, 200; dried blood, 50	3,900	647	3,309	238	11
12	Acid phosphate, 320, muriate potash, 200; nitrate soda, 360: dried blood, 50	3,920	613	3,499	393	12
13	None	3,360	.....	3,141	.....	13
14	Acid phosphate, 480; muriate potash, 300; nitrate soda, 280, dried blood, 50	4,64[illegible]	1,467	3,518	463	14
15	Acid phosphate, 480; muriate patash, 300; nitrate soda, 320	4,2[illegible]	1,393	3,491	521	15
16	None	2,800	.....	2,884	.....	16
17	Yard manure, 4 tons on wheat	2,990	373	3,310	523	17
18	Yard manure, 8 tons on wheat	2,680	247	3,677	984	18
19	None	2,250	.....	2,596	.....	19
20	Acid phosphate, 320; muriate potash, 200; nitrate soda, 140; dried blood, 25	3,100	733	3,289	655	20
21	Same elements as 20, but nitrogen in oilmeal	2,790	307	2,901	227	21
22	None	2,600	.....	2,713	.....	22
23	Same elements as 20, but nitrogen in dried blood	3,030	477	2,957	266	23
24	Same elements as 20, but nitrogen in sulphate ammonia	3,020	513	2,930	261	24
25	None	2,460	.....	2,647	.....	25
26	Same elements as 11, but phosphorus in bonemeal	2,870	510	3,221	529	26
27	Same elements as 11, but phosphorus in dissolved boneblack	2,800	540	3,071	335	27
28	None	2,160	.....	2,782	.....	28
29	Same elements as 11, but phosphorus in basic slag	3,000	843	3,538	788	29
30	Yard manure, 8 tons on potatoes	3,290	1,137	3,546	827	30
31	None	2,150	.....	2,689	.....	31
32	Yard manure, 16 tons on wheat	3,880	1,750	3,189	1,083	32
33	Same elements as 20, but nitrogen in tankage	3,110	1,000	2,435	270	33
34	None	2,090		2,234		34
	Average unfertilized yields	2,832		2,961		

BARNYARD MANURE TEST.

COMPARISON OF YARD WITH FRESH MANURE. THE REINFORCEMENT OF MANURE.

This experiment was begun in 1897 for the purpose of comparing manure which has lain for some months in an open barnyard with that taken directly from the stable to the field, and of studying the effect of treating the manure with several absorbent or reinforcing materials.

In this investigation a lot of manure has been taken from the open barnyard, where it has been accumulating during the winter, and divided into four parcels. With one parcel is mixed the finely ground, phosphatic rock, known as floats, from which acid phosphate is made by mixing it with sulphuric acid; with another parcel acid phosphate is mixed; with a third, the crude potash salt, known as kainit, and with a fourth, land plaster, or gypsum; the reinforcing materials being used at the uniform rate of 40 pounds per ton of manure. At the same time manure taken from box stalls, where it has accumulated under the feet of animals kept continuously in their stalls, is divided into similar parcels and treated with like quantities of the same materials.

After a few weeks the manure thus treated, together with two lots of untreated manure, one taken from the yard and one from the stable, are spread upon clover sod at the rate of 8 tons per acre and plowed under for corn, the corn being followed by wheat and clover in a 3-year rotation. During the first three seasons soy beans were grown, because of clover failure, and were plowed under.

Three tracts of land, A, B and C, are included in the test, each crop being grown every season. The arrangement of these tracts and the plan of fertilizing are shown in Diagram V.

DIAGRAM V: ARRANGEMENT OF PLOTS AND PLAN OF FERTILIZING IN EXPERIMENTS WITH MANURE.

PLOTS ONE-SIXTEENTH ACRE.

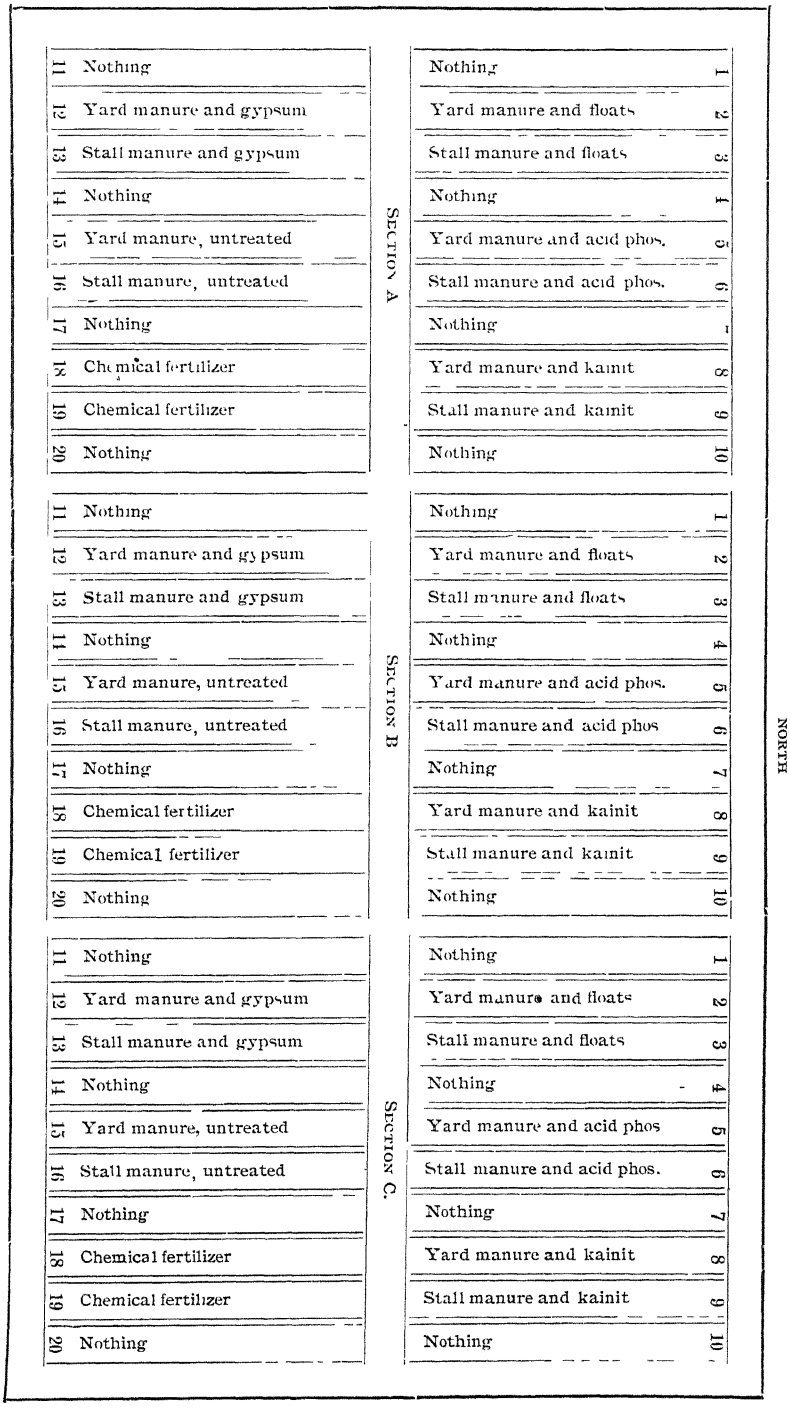


TABLE X: BARNYARD MANURE ON CROPS GROWN IN 3-YEAR ROTATION. YIELD PER ACRE, 1907.

Plot	Manure and treatment.	Corn		Wheat		Hay
		Grain	Stover	Grain	Straw	
No.		Bus.	Lbs.	Bus.	Lbs.	Lbs.
1	None	29.14	2,192	14.28	2,132	1,881
2	Yard manure and floats	48 69	3,008	21.73	3,428	2,710
3	Stall " " "	62 06	3,488	26.40	3,840	2,899
4	None	14 98	1,632	13.93	1,932	1,870
5	Yard manure and acid phosphate	55 54	3,168	26 93	3,664	2,880
6	Stall " " " "	60 46	3,520	28 13	3,800	2,854
7	None	21 82	1,824	15.33	1,928	2,060
8	Yard manure and kainit	38 29	2,464	26 40	3 312	2,533
9	Stall " " "	56.74	3,488	28 40	3.592	2,858
10	None	18 56	1,824	14.67	1,744	2,899
11	None	43 26	2,680	15.60	1,992	2,374
12	Yard manure and gypsum	59.89	3,840	24.87	3,292	2,495
13	Stall " " "	58.06	3.616	27.40	2,540	2,365
14	None	17.71	1,792	16.67	2,136	1,926
15	Yard manure, untreated	43.83	2,816	27.20	3,424	2,218
16	Stall " "	52.18	3,360	27.47	3,456	2,643
17	None	21.42	2,048	15.47	2,000	2,008
18	Chemical fertilizer[1]	30 22	2,080	20.60	2,444	3,302
19	" " [2]	20.91	1,680	21.80	3,245	3,315
20	None	16.98	1,728	14.27	1.592	2,778

[1] Acid phosphate, 80 lbs.; muriate potash, 80 lbs.; nitrate soda, 160 lbs.
[2] " " 80 " " " 100 " tankage (7-30) 100 lbs.

TABLE XI: BARNYARD MANURE ON CROPS GROWN IN 3-YEAR ROTATION, AVERAGE YIELD PER ACRE, 1897 TO 1907.

Plot	Manure and treatment	Corn, 11 years		Wheat, 10 years		Hay 7 years
		Grain	Stover	Grain	Straw	
No.		Bus.	Lbs.	Bus.	Lbs.	Lbs.
1	None	37.97	2,257	11 49	1,425	2,363
2	Yard manure and floats	58 83	3,316	24 21	2,627	3,660
3	Stall " " "	62.99	3,617	25.82	2,828	4,293
4	None	31.40	2,010	10.24	1,193	1,771
5	Yard manure and acid phosphate	59.65	3,277	24 65	2,615	3,422
6	Stall " " " "	64 49	3,533	25.55	2,800	4,212
7	None	31.53	1,997	9.44	1,115	1,728
8	Yard manure and kainit	54.17	3 157	20.87	2,330	2,922
9	Stall " " "	60.09	3,545	22 97	2,657	3,711
10	None	32.61	2,007	10.43	1,212	2,016
11	None	37.61	2,388	12.52	1,547	2,685
12	Yard manure and gypsum	57.75	3,416	22.88	2,562	3,248
13	Stall " " "	60.56	3,634	22.89	2,577	3,172
14	None	32.49	2,033	9.61	1,105	1,669
15	Yard manure, untreated	50.61	2,909	18.20	2,071	2,409
16	Stall " "	58.19	3,371	19.73	2,237	3,069
17	None	36.34	2,315	9.93	1,209	1,982
18	Chemical fertilizer[1]	42.54	2,578	12.70	1,508	2,699
19	Chemical fertilizer[2]	43.29	2,443	14.38	1,733	2,842
20	None	34.15	2,035	10.08	1,250	2,216
	Average unmanured yield	34.57	2,129	10 43	1,220	2,009

[1] Acid phosphate, 80 lbs.; muriate potash, 80 lbs.; nitrate soda, 160 lbs.
[2] " " 80 " " " 10 " tankage (7-30) 100 lbs.

The financial outcome of this test is shown in Table XII, in which the materials used in treatment are re-valued in accordance with present prices.

It will be observed that the increase produced by the ton of stall manure has in every case been greater than that from the ton of yard manure similarly treated, and that the ton of stall manure treated with acid phosphate has produced more than double the increase recovered from the ton of untreated yard manure.

While the treatment of manure has in every case increased its effectiveness, the gain per acre produced by reinforcing the manure with acid phosphate has been so much greater than that from any other treatment that it has not been profitable to use anything else, even though the other materials had cost nothing.

TABLE XII: BARNYARD MANURE ON CROPS GROWN IN 3-YEAR ROTATION.

SUMMARY: INCREASE PER ACRE AND ITS VALUE.

Plot	Manure and treatment	Cost of treatment per acre	Average increase per acre					Net value of increase		Plot
			Corn–11 years		Wheat–10 years		Hay 7 years	Per acre	Per ton Manure	
			Grain	Stover	Grain	Straw				
No.		$	Bus.	Lbs.	Bus.	Lbs.	Lbs.	$	$	No.
2	Yard manure and floats	1.40	23.05	1,142	13.14	1,279	1,494	26.73	3.41	2
3	Stall " " "	1.40	29.40	1,525	15.16	1,558	2,325	35.63	4.45	3
5	Yard manure and acid phosphate	2.40	28.21	1,271	14.68	1,448	1,666	30.65	3 83	5
6	Stall " " " "	2.40	33.00	1,532	15.84	1,659	2,470	37.31	4.66	6
8	Yard manure and kainit	2.70	22.28	1,157	11.10	1,183	1,098	22.40	2.80	8
9	Stall " " "	2.70	27.84	1,542	12.87	1,477	1,791	29.69	3.71	9
12	Yard manure and gypsum	1.00	21.85	1,146	11.33	1,162	902	23.29	2 91	12
13	Stall " " "	1.00	26.37	1,482	12.31	1,324	1,164	28.60	3.57	13
15	Yard manure, untreated	....	16.84	781	8.48	932	636	18 17	2 27	15
16	Stall " "	....	23.12	1,150	9.91	1,062	1,191	24.73	3.09	16
18	Chemical fertilizer[1]	7.45	6.93	357	2.72	285	639	0 87	..	18
19	" " [2]	2.20	8.41	314	4.36	497	703	8 63	..	19